

**ATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY EXAMINATION REPORT**  
(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference <b>XA1547</b>	<b>FOR FURTHER ACTION</b>	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. <b>PCT/GB 03/03552</b>	International filing date (day/month/year) <b>14.08.2003</b>	Priority date (day/month/year) <b>21.08.2002</b>
International Patent Classification (IPC) or both national classification and IPC <b>B29C53/04</b>		
Applicant <b>BAE SYSTEMS PLC et al.</b>		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 8 sheets, including this cover sheet.

This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

- I  Basis of the opinion
- II  Priority
- III  Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV  Lack of unity of invention
- V  Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI  Certain documents cited
- VII  Certain defects in the international application
- VIII  Certain observations on the international application

Date of submission of the demand <b>01.03.2004</b>	Date of completion of this report <b>05.11.2004</b>
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer <b>Foulger, C</b> Telephone No. +49 89 2399-2944



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**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-7 as originally filed  
8, 9 received on 15.07.2004 with letter of 12.07.2004

**Claims, Numbers**

1-9 received on 15.07.2004 with letter of 12.07.2004

**Drawings, Sheets**

1/5-5/5 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- the description, pages:
- the claims, Nos.:
- the drawings, sheets:

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5.  This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

**see separate sheet**

6. Additional observations, if necessary:

**III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

the entire international application,

claims Nos. 16-18

because:

the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 16-18 are so unclear that no meaningful opinion could be formed (*specify*):

**see separate sheet**

the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

no international search report has been established for the said claims Nos.

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

the written form has not been furnished or does not comply with the Standard.

the computer readable form has not been furnished or does not comply with the Standard.

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	1-5,7,9,10,12-15
	No: Claims	6,8,11,13
Inventive step (IS)	Yes: Claims	
	No: Claims	1-15
Industrial applicability (IA)	Yes: Claims	1-15
	No: Claims	

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**2. Citations and explanations**

**see separate sheet**

**Re Item III**

**Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

1. The amendments filed with the letter dated 12.07.2004 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT. The amendments concerned are the following:
  - a. In independent method claim 1, independent products claims 6 and 8: "the fold line extending only partially across the blank".
  - b. In independent product claim 8: "wherein the first region of the bracket extends either side of the plane of the second region of the bracket".
  - c. In independent device claim 9: " the hinge extends only partially across the tool thereby allowing the first surface to extend either side of the plane of the second surface when the angle between the surfaces is not zero".
2. The reasons for the extension are the following:
  - a. Concerning the amendment a, the fold line in figure 5 actually extends across the blank. The blank has got a Z form and the end of the fold line corresponds to the edge of the blank. There is a space between the end of the fold line and the beginning of two branches of the blank.
  - b. The basis for this modification could not be found in the application as originally filed.
  - c. Concerning the amendment c, the hinge in figure 7 extends across the tool. The reasons correspond to the reasons detailed for amendment a.
3. Consequently, the modified claims are not taken into account in the IPER. The report concerns the application as originally filed.
2. The subject-matter of independent claims 16, 17 and 18 is defined with reference to the figures and not by proper technical features.  
These claims are not clear (Article 6 PCT).

**Re Item V**

**Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. The application does not meet the requirements of the PCT, because the subject-matter of method claim 1 is not inventive in the sense of Article 33(3) PCT, for the following reasons:
  - 1.1. Document EP 0 594 096 (D1) discloses (applying the wording of present claim 1) a method of forming a bent part (figures 10 and 12, reference sign 12) including the steps of:
    - cutting out a blank (figure 1, (12)), having at least one fold line (18) defining first and second regions of the blank (figure 1, column 10, lines 13 to 18), from a sheet of composite material (column 9, lines 57 to column 10 10, line 7) and then using a forming tool (figure 1, (14)),
    - undertaking a bending operation to bend the blank about the at least one fold line to create a predetermined angle between said first and second regions to form the required three-dimensional shape (figure 8),
    - curing the part (column 17, last line: "Verfestigung").
  - 1.2. It is pointed out that D1, as does the present application (see description page 4, line 5 and paragraph 5; page 5, lines 7 to 10), discloses a part made of a thermoplastic material or more generally a material which can liquefy (column 10, first paragraph). It seems that the step of curing the part refers to the solidification of the thermoplastic.
  - 1.3. Consequently, the method according to claim 1 only differs from the method according to D1 in that claim 1 is directed to the fabrication of a bracket. However, it is obvious for the skilled person that the method according to claim 1 is suitable for the fabrication of a bracket and the skilled person will use the method according to D1 to form a bracket without exercising any inventive skill.
  - 1.4. The subject-matter of claim 1 is thus not considered as inventive.
  - 1.5. The subject-matter of dependent method claims 2 to 5 comes within the scope of the customary practice followed by persons skilled in the art and is also not considered as inventive.

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2. Independent product claim 6 discloses a blank suitable for forming a bracket. Such a blank is disclosed in D1 (see the above cited passages). The blank according to D1 can perfectly be used to form a bracket.
- 2.1. Additionally, a blank which is Z-shaped does not seem to involve an inventive step. The skilled person will adapt the form of the blank to the form of the product to be produced.
3. Document WO 03/022677 (D2) discloses (applying the wording of independent claim 8) a bracket formed from a single sheet of composite material cut into a pre-determined shape (claim 1, figures 1 and 2).
  - 3.1. Consequently, the subject-matter of independent claim 8 is not new.
  - 3.2. The subject-matter of dependent product claim 9 comes within the scope of the customary practice followed by persons skilled in the art and is considered as not inventive.
4. The subject-matter of claim 11 is a tool suitable for forming a bracket. Consequently, only the technical features defining the tool are taken into account for the establishment of the opinion with regard to novelty, inventive step of the subject matter of claim 11. The technical features concerning the bracket in itself are not part of the subject-matter of independent device claim 11.
  - 4.1. US 4,744,846 (D3; see column 4, last paragraph) discloses (applying the wording of claim 11) a tool (column 4, line 60) suitable for forming a bracket comprising two surfaces on which the blank is placed (figure 3, reference signs 6 to 9) connected by an hinge, the fold line of the blank being aligned with the bending mandrel axis, and the device being set to allow the blank to be bent to the predetermined angle.
5. Moreover, the subject-matter of independent product claim 12 lacks an inventive step considering the D1. The reasoning made for the method according to 1 applies to the product according to claim 12.

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6. Document WO 03/008265 (D4) discloses applying the wording of independent product claim 13 an aircraft wing (claim 6), rib and stringer arrangement including a series of brackets (page 3, lines 14 to 16) wherein each bracket in the series is formed from composite material (claim 1) cut into the same general profile.
  - 6.1. Document WO 03/022677 also discloses such an aircraft wing.
7. Moreover, the subject-matter of product claim 13 is generally known and dependent claim 14 is not inventive.

**Certain defects in the international application.**

1. The relevant prior art documents D1, D2, D3 and D4 are not identified in the description (Rule 5.1(a)(ii) PCT).
2. Moreover, the features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

**Certain observations on the international application.**

1. The application does not meet the requirements of Article 6 PCT, for the following reasons:
  - 1.1. The various definitions of the an aircraft wing given in the independent product 13 and dependent claim 15, and the various independent product claims (claim 6: blank, claim 8: bracket, claim 12: component, claim 13: aircraft wing) induce a lack of clarity of the definition of the invention and renders the application as a whole unclear.
  - 1.2. Moreover, considering the 5 independent claims, the application lacks conciseness.
  - 1.3. According to Rule 6.1a) and b), undue repetition of wording, as clearly present in these 5 claims, should be avoided by the use of the dependent form.

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Figure 6 shows the blank of Figure 5 having been formed to the required three-dimensional shaped bracket;

Figure 7 shows the bracket of Figure 6 on a forming tool used to bend the blank of Figure 6 to the required three-dimensional shape;

5 Figure 8 shows a finished bracket according to the present invention;

Referring firstly to Figures 1 to 3, examples of brackets used in aircraft manufacture as well as other constructions are shown. Figures 1a and 1b show an angle bracket 10 used to joint two components (not shown), the components being attached to surfaces 12 and 14 with fasteners such as bolts and nuts 16, 10 through holes 18a, 18b drilled in the bracket 10.

Figures 2a and 2b show a box bracket 20 used to join at least two components, the components being attached at surfaces 22, 24, 26, 28.

Figures 3a and 3b show a butterfly bracket 30 used to join at least two components, the components being attached at surfaces 32 and 34.

15 Figure 4 shows how complex structures can be joined using brackets as described above.

Part of a wing box 40 is constructed using butterfly brackets, 42a, 42b, 42c, to join stringers 44a, 44b, 44c to rib 46.

20 Figure 5 shows a blank 50 in accordance with the present invention cut from a sheet of composite material with a resin matrix. A fold line 52 defining regions 54 and 56 is marked on the upper surface of the blank to act as a guide during the subsequent bending operation. The blank 50 is substantially 'Z'-shaped. This shape allows a bracket suitable for use where a butterfly bracket 30 according to the prior art would previously have been used to be formed in a 25 one-stage forming process.

Figure 6 shows the blank 50 having been bent about the fold line 52. Region 54 is no longer in the same plane as region 56. The angle between the two regions 54, 56 can be controlled to create the required three-dimensional shaped bracket.

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As the blank is bent about fold line 52 curve 58 is formed. By setting the size of the hinge (not shown) or other bending device used, the angle of curvature of curve 52 can be controlled. If required additional 90° fibres can be included in the lay up of the composite material from which the blank 50 is cut at 5 the location of the curve to provide additional strength characteristics.

Figure 7 shows the blank 50 of Figure 6 on the tooling 70 used to bend the blank 50 to the required bracket shape. The tooling 70 comprises two forming plates 74, 76 attached via a hinge or other hinge-like mechanism that will allow the plates 74, 76 to rotate with respect to each other. In this example 10 plate 76 is held fixed and plate 74 is allowed to rotate about the hinge that has previously been aligned with fold line 52 and the blank 50 secured in position.

Figure 8 shows a finished bracket 80 that has been formed as described above and with fastener holes 82a, 82b, 82c, 82d drilled ready for use.

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CLAIMS

1. A method of forming a bracket including the steps of:
  - (i) cutting out a blank from a sheet of composite material, the blank having at least one fold line defining first and second regions of the blank, the fold line extending only partially across the blank, and then, using a forming tool
  - (ii) undertaking a bending operation to bend the blank about the fold line only to create a predetermined angle between said first and second regions to form the required three-dimensional shape,
  - (iii) curing the bracket.
2. A method of forming a bracket according to claim 1 wherein the bending operation and curing are concurrent.
3. A method of forming a bracket according to claim 1 wherein the bending operating is completed before curing begins.
4. A method of forming a bracket according to any preceding claim wherein the forming tool can be set to create different values of said predetermined angle allowing different three-dimensional shaped brackets to be formed.
5. A method of forming a bracket according to any preceding claim including the step of undertaking a further bending operation to bend the blank about a further fold line.
6. A blank cut from a sheet of composite material for forming a bracket, the blank having at least one fold line defining first and second regions of the blank, the fold line extending only partially across the blank.
7. A blank according to claim 6 which is substantially Z-shaped.
8. A bracket formed from a sheet of composite material cut into a blank of pre-determined shape, the blank having at least one fold line defining substantially planar first and second regions of the bracket, the fold line extending only partially across the blank, the blank having been bent

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about the fold line only to form a three dimensional bracket wherein the first region of the bracket extends either side of the plane of the second region of the bracket.

9. A tool for forming a bracket comprising two substantially planar surfaces, the first surface being connected to the second surface by a hinge, the hinge allowing one surface to be rotated to a predetermined angle relative to the other surface, wherein the hinge extends only partially across the tool thereby allowing the first surface to extend either side of the plane of the second surface when the angle between the surfaces is not zero.
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